

DESCRIPTION OF *GUARANIDRILUS OREGONENSIS*
(OLIGOCHAETA: ENCHYTRAEIDAE) FROM
NORTH AMERICA, WITH ADDITIONAL COMMENTS
ON THE GENUS

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Abstract.—*Guaranidrilus oregonensis*, n. sp., is described from specimens found in the Columbia River near Miller Sands, Oregon, and its relationships to other nominal species of *Guaranidrilus* are briefly considered. This is the first record of the genus from North America. Examination of type material of *G. glandulosus*, type species of the genus, and of *G. rarus*, showed that the former does not have esophageal appendages in VI, like *G. oregonensis*, and that the former two species are quite distinct. *Guaranidrilus sawayai* is a probable synonym of *G. rarus*. The new species is closely related to *G. glandulosus*, and two other species without esophageal appendages. A comparative table allows quick distinction of species of *Guaranidrilus* without oesophageal appendages.

The genus *Guaranidrilus* was erected by Cernosvitov (1937a, b) for three enchytraeid species from Argentina, *G. glandulosus*, *G. rarus* and *G. fridericoides*, the latter of which is a nomen nudum, and, provisionally, for *G. columbianus* (Michaelsen, 1913) from Colombia. Brinkhurst & Jamieson (1971) subsequently designated *G. glandulosus* as the type species. Some diagnostic characteristics of *Guaranidrilus* noted by Cernosvitov (1937a, b) were occurrence of two setae in each setal bundle, compact appendages on the dorsal side of the esophagus in VI, a large pair of intestinal diverticula originating at the transition from oesophagus to intestine, coiled vasa deferentia, and adiverticulate spermathecae not communicating with the intestine.

Guaranidrilus lamottei was described by Omodeo (1958) from Ivory Coast, but none of the nine specimens examined was mature. Omodeo expressed some ambivalence about whether the specimens should be attributed to *Guaranidrilus* or to a new genus. The systematic position of this species is

still uncertain (Righi 1973, Healy 1979) and no type material is locatable.

Seven other species of *Guaranidrilus* have since been described from Brazil: *G. sawayai* Righi, 1973, *G. mboi* Righi, 1975, *G. athecatus* Christoffersen, 1977, *G. atlanticus* Christoffersen, 1977, *G. joanae* Christoffersen, 1977, *G. oiepe* Righi, 1974, and *G. finni* Christoffersen, 1977. The latter two species lack esophageal appendages in VI. In the most recent review of *Guaranidrilus*, Healy (1979) described *G. europeus*, the first species from Europe, which also is without esophageal appendages in VI. She also described *G. cernosvitovi* Healy, 1979, based on undescribed material collected by Cernosvitov (1937b) (see *G. fridericoides* nomen nudum). This review did not cover the recently described South American species.

Healy (1979) examined Cernosvitov's original material of *Guaranidrilus*, located at the British Museum (Natural History) (BMNH), and syntypes of *G. columbianus* in the Zoologisches Museum, Hamburg. After her examinations, Healy questioned the

validity of *G. rarus*, suggesting that it could not be distinguished reliably from *G. glandulosus*. The quality of the syntype material of *G. columbianus* did not allow Healy to confirm all recorded anatomical details, but characteristics such as the presence of bilobed gut diverticula and form of the nephridia indicated to her that it belongs in *Guaranidrilus*, and, probably, is distinct from the other species, although presently not fully described.

In a phylogenetic study (Coates 1987a) it was found that both bisetate setal bundles and free adiverticulate spermathecae are plesiomorphies of Enchytraeidae. As well, coiled vasa deferentia is a synapomorphy of all or most of Enchytraeidae, although lost in more recent lineages (Coates 1987b, in press a). Within *Guaranidrilus*, gut diverticula have been lost one or more times and extra-lineal hybridization possibly complicates the genealogy of the lineage (Coates, in press b).

Recent collections made in the Columbia River near Miller Sands, Oregon, yielded the first specimens of *Guaranidrilus* for North America.

Material and Methods

Type specimens of *Guaranidrilus glandulosus*, *G. rarus*, *G. europeus*, and *G. cernovitovi* were borrowed from the BMNH. Material of the new species was received from benthic collections made by the United States Army Corps of Engineers, from a field study to test the feasibility of developing marsh habitats on dredged material in the Columbia River estuary, Oregon (see Clairain et al. 1978 for details). All of the new material was stained in alcoholic borax carmine, dehydrated through an ethanol to xylene series then mounted whole in Canada balsam. Type material of the new species has been deposited at the National Museum of Natural History, Smithsonian Institution (USNM) and at the Royal Ontario Museum, Department of Invertebrate Zoology (ROMIZ).

Guaranidrilus Cernovitov, 1937

Guaranidrilus Cernovitov, 1937a:148–149.—1937b:282–283. Healy, 1979:7–8.

Type species.—*Guaranidrilus glandulosus* Cernovitov, 1937.

Discussion.—Nominal species of *Guaranidrilus* are small to medium-sized terrestrial and freshwater enchytraeids with simple-pointed, anodulate, straight or slightly curved setae. These occur in 4 bisetate bundles per segment, except laterally in XII of mature specimens and rarely in some preclitellar segments. The head pore is anterior on the prostomium, and other coelomic pores are absent. Secondary pharyngeal gland lobes may be present. The species have compact nephridia with large anteseptal parts including some of the efferent canal. Their seminal vesicles are unpaired and dorsal, or apparently absent, and vasa deferentia are usually coiled. Vasa deferentia terminate in very small or no penial bulbs. Spermathecae, if present, are paired, free, with thick-walled ectal ducts and usually a sperm-containing dilation in V. The saccate ampulla may extend through several segments. The genus is primarily characterized by a pair of hollow, dorso-lateral gut diverticula originating near 7/8 or, rarely, originating in X. The diverticula sometimes are constricted, forming anterior and posterior lobes. These diverticula have been lost in some species.

Overall, the nominal species of *Guaranidrilus* are relatively underived within the lineage of Enchytraeidae. Only the presence of gut diverticula has been determined to be a synapomorphy of the genus (Coates, in press b). Gut diverticula at the esophago-intestinal transition (usually about VIII) also occur in the enchytraeid genera *Buchholzia*, *Enchylea*, *Punahenlea*, *Henlea*, and *Aspidodrilus*. The evolutionary origins of their diverticula are apparently all independent of those in nominal species of *Guaranidrilus* and, at least, some diverticular forms are reported to be distinguishable by their gen-

eral appearances (Healy 1979). One group of *Guaranidrilus* is further characterized by esophageal appendages in VI. The species of this group also have relatively large seminal vesicles, whereas these are apparently absent or small in other nominal species of *Guaranidrilus*.

Specimens of several nominal species of *Guaranidrilus* with esophageal appendages, namely *G. atlanticus*, *G. athecatus*, *G. joanae*, and *G. mboi*, were not available (G. Righi & M. L. Christoffersen, pers. comm.) during the period of this research. Examination of specimens is required in order to complete a revision of the genus both because of taxonomic problems (see below) and descriptive inconsistencies. Each of these species does have some easily recognized specific characteristic: *G. atlanticus* has single esophageal diverticula in VI; *G. athecatus* lacks spermathecae; *G. joanae* has setae with very broad ental ends in anteriormost and posteriormost segments; and *G. mboi* has a pair of gut diverticula in X, rather than at 7/8 and is without pharyngeal glands at 6/7.

The summarized status of the nominal species of *Guaranidrilus* as a result of the conclusions drawn by Righi (1973), Christoffersen (1977), Healy (1979), Coates (1987a, in press a, b), and the taxonomic studies herein is:

group 1: without esophageal appendages, with small or no seminal vesicles:

G. glandulosus Cernosvitov, 1937

G. oiepe Righi, 1974 (?=*G. glandulosus*)

G. europeus Healy, 1979

G. oregonensis new species;

group 2: with esophageal appendages, in VI, rarely absent; seminal vesicles large, rarely absent:

G. rarus Cernosvitov, 1937 (*G. sawayai* Righi, 1973 = *G. rarus*) (see following)

G. cernosvitovi Healy, 1979

G. mboi Righi, 1975

G. joanae Christoffersen, 1977

G. athecatus Christoffersen, 1977

G. atlanticus Christoffersen, 1977, with several described forms

G. finni Christoffersen, 1977;

other species:

G. columbianus (Michaelsen, 1913) sp. dubia, incompletely described

G. lamottei Omodeo, 1958 gen. dubia, incompletely described, based on immature specimens.

New Species Description and Remarks on Other Species

A. Species without esophageal appendages in VI

Guaranidrilus oregonensis, new species
Figs. 1, 2

Material examined.—Columbia River, Miller Sands, Oregon, about 46°15.00'N at 123°37.50'W. Collected VIII.1980 by E. J. Clairain and C. Newling. Holotype (USNM 118242) and 6 paratypes (USNM 118243–118245; and ROMIZ I1226–1228).

Etymology.—Named for the type locality.

Description.—Fixed, whole-mounted specimens 3.0 to 4.5 mm long, 0.19 to 0.24 mm [\bar{x} = 0.22, s = 0.02, n = 5] wide at clitellum (specimens slightly compressed) (Fig. 1A); with 26 to 34 segments. Head pore dorsal on anterior third of prostomium. Setae 2 per bundle, absent entirely from XII, straight with ental hook. Preclitellar ventral setae 24 to 33 μ m [\bar{x} = 29, s = 4, n = 4] long (Fig. 1B, b); setae from clitellum to posterior 4 or 5 segments 28 to 41 μ m [\bar{x} = 35, s = 5, n = 5] long; posterior setae 52 to 78 μ m [\bar{x} = 62, s = 9, n = 6] long (Fig. 1B, a); more or less equal laterally and ventrally. Clitellum (Fig. 1A, c) extending over ½ XII to ½ XIII. Gland distribution: irregular dorsally, disrupted by large hyaline cells; in transverse rows ventro-laterally; reduced but complete ventrally between male pores. Cutaneous glands inconspicuous, in 1 to 4 regular transverse rows per segment, if only

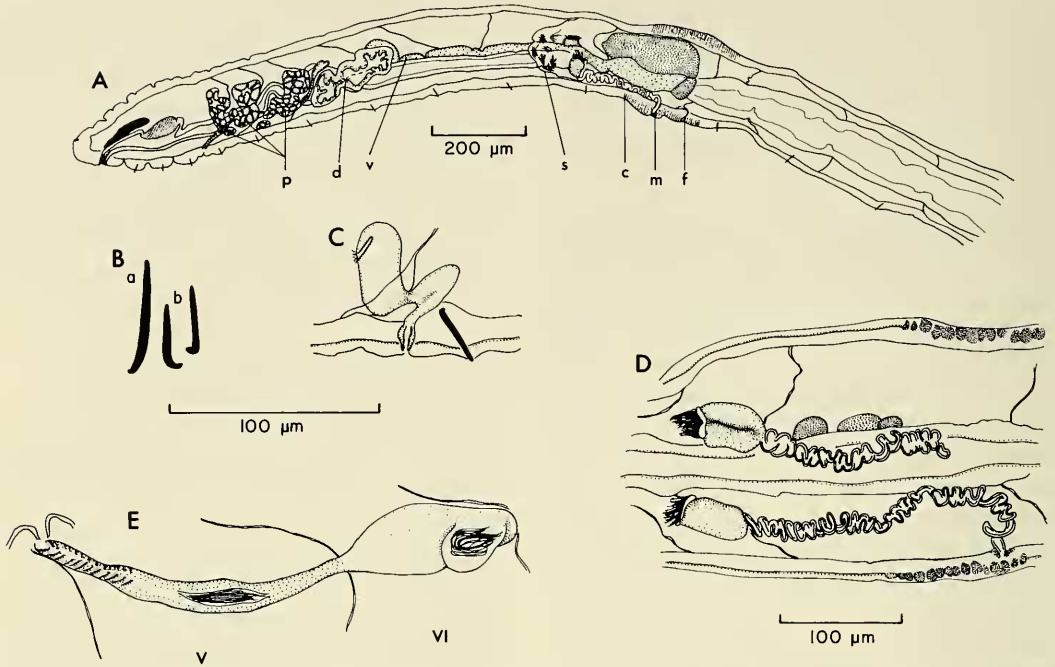


Fig. 1. A–E, *Guaranidrilus oregonensis*, n. sp., whole-mounted specimens. A, Lateral view of anterior segments through segment XVI; B, Setae from posterior segments, XXVIII or XXIX, and b. anterior segments III and IV; C, Nephridium at 7/8; D, Sperm funnels, vasa deferentia and male pore, ventro-lateral view; E, Spermatheca, dorso-lateral view; Abbreviations: c, clitellum; d, gut diverticulum; f, female pore; m, male pore; p, pharyngeal glands; s, seminal vesicle; v, dorsal blood vessel.

1 row, mid-segmental. Spermathecal pore small, in 4/5 in line with lateral setae; male pore small, in line with ventral setae, on a small papilla. With sensory or adhesive papillae on pygidium. *Internal*.—Posterior margin of brain deeply incised. Dorsal anterior blood vessel bifurcating in prostomium, originating in X to XII (Fig. 1A, v). Pharyngeal glands (Fig. 1A, p) united dorsally at 4/5, 5/6 and 6/7; ventral lobes in V and VI; small, secondary glands antero-ventral in V and VI. Bilobed gut diverticula (Fig. 1A, d) communicating with gut in posterior half of VII, posterior lobes of diverticula extending into VIII; inner walls of diverticula ciliate. Without other gut diverticula or appendages. Chloragocytes golden-brown, most obvious in preclitellar segments. Lymphocytes nucleate, egg-shaped. Preclitellar nephridia on 6/7 through 8/9 (Fig. 1C); preseptal part half or more of entire nephridium; efferent duct terminal; in-

terstitial tissue well-developed. Postclitellar nephridia of same shape as preclitellar, usually only 1 or 2 pairs. Seminal vesicle small (Fig. 1A, s) extending into X. Testes compact, paired on posterior of 10/11. Sperm funnels cylindrical, canal eccentric; granular; funnels about $61 \mu\text{m}$ [$n = 3, s = 22$] long and $42 \mu\text{m}$ [$n = 3, s = 7$] wide; collar subequal funnel width (Fig. 1D). Vasa deferentia long, narrow, coiled in XII (Fig. 1D); with very slight widening at penial pore. Male pore simple (Fig. 1A, m), without penial bulb, but with glandular, slightly enlarged, epidermal cells adjacent. Ovaries paired ventrally on posterior of 11/12. Female funnel (Fig. 1A, f) on 12/13, inconspicuous; pore in or just posterior to 12/13. Eggs extending posteriad into XV, in an egg sac, usually only 1 egg large. Spermathecal ectal ducts (Fig. 1E) thick-walled, without associated glands, with a small, sperm-containing widening in V; ampulla thin-walled,












	<i>oregonensis</i> n. sp.	<i>glandulosus</i> Cernos.	<i>aciepe</i> Right	<i>europaeus</i> Healy	<i>finni</i> Christoffersen
body length (mm)	3.0-4.5	3-7	3.5-8.5	3-6	8-14
number of segments	26-34	-	31-34	23-29	41-56
setal length anterior (µm)	24-33	≈33	≈36	≈20	24-32
setal length posterior (µm)	52-78	≈54	≈57	≈37	48-61
gut diverticula	bilobed	bilobed	unilobed	bilobed	bilobed
pharyngeal glands					
secondary lobes 	present	absent	absent	present	present
spermathecae					
scale equals 0.1 mm					
seminal vesicle	anterior	absent	absent	small/absent	anterior & posterior

Fig. 2. Tabular comparison of *Guaranidrilus oregonensis* n. sp. and the 4 other nominal species of *Guaranidrilus* without esophageal appendages.

irregular shaped, saclike, extending to VI or VII; sperm free in ampulla.

Habitat and distribution.—The Miller Sands area in the Columbia River, Oregon, is an active site for the disposal of dredged material. Snag Island, on which the oligochaetes were found, was a natural marsh used as a reference area. The tidal range in the freshwater marsh habitat of the worms was 1.9 m. *Guaranidrilus* specimens were collected in the high marsh where the sediments were a matrix of rhizomes and sandy mud (61% silt-clay) with 4.5% volatile solids. The dominant plants were spike-rush (*Eleocharis palustris*), Lyngby's sedge (*Carex lyngbei*), and tufted hairgrass (*Deschampsia caespitosa*) (Clairain et al. 1978).

The benthos in this habitat was dominated numerically by oligochaetes, 93% of the total, with 84% of them being tubificids, 14% enchytraeids, and 2% lumbriculids.

Other dominant taxa were the amphipod *Anisogammarus confervicolus*, sphaeriid clam, *Corbicula fluminea*, and chironomid and chrysomelid insect larvae (Clairain et al. 1978). In general the oligochaete fauna of the Miller Sands area is diverse with many unusual tubificid species (Brinkhurst & Diaz 1985).

Remarks.—A few characteristics distinguish *Guaranidrilus oregonensis* and *G. glandulosus*. Small differences exist between the species in location of the origin of the dorsal blood vessel, in distribution of clitellar gland cells, and in form of pharyngeal glands (Fig. 2). *Guaranidrilus glandulosus* also is reported to lack a seminal vesicle whereas one is present, although small, in *G. oregonensis*.

A further reason for recognition here of a distinct species is the apparent geographic separation of the respective populations of

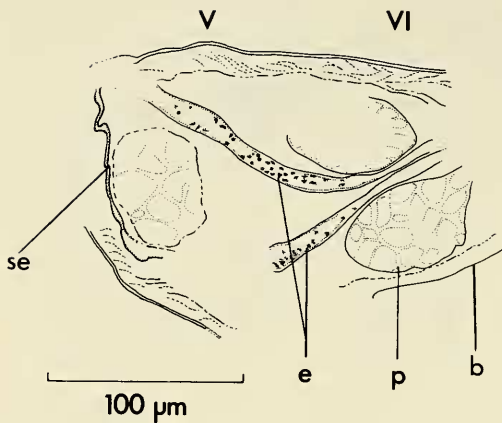


Fig. 3. *Guaranidrilus glandulosus*, BMNH 1949.3.1.951, dorsal sagittal section through V and VI showing ectal ducts of spermathecae. Abbreviations: b, body wall; e, spermathecal ectal ducts; p, pharyngeal glands (dorsal lobe at 5/6); se, septum.

Guaranidrilus glandulosus and *G. oregonensis*. Broad dispersion of some earthworm species by human activities are reported (Sims & Gerard 1985), but there is no existing evidence for this having occurred with *Guaranidrilus* species. There are few records of the genus outside of South America (Europe in Healy 1979; and Florida, Healy, pers. comm.) and few of the species are known to have large ranges of distribution. That of *G. rarus*, including Argentinian and Brazilian localities, is the broadest if the proposed synonymy of *G. sawayai* is valid.

It is of concern that descriptions of both *Guaranidrilus oregonensis* and *G. glandulosus* were based on small numbers of specimens and that both South and North America are poorly explored for enchytraeids. As well, there is no clear indication of the conditions required for speciation within enchytraeid lineages (Coates 1987b). Long periods of geographic separation need not guarantee the development of reproductive isolation mechanisms nor evolution in unique directions, unconstrained by earlier, shared historical events.

Guaranidrilus oregonensis is compared to *G. glandulosus* and the three other nominal

species of *Guaranidrilus* without esophageal appendages, *G. europeus*, *G. oiepe*, and *G. finii*, in Figure 2.

Guaranidrilus glandulosus

Cernosvitov, 1937

Figs. 2, 3

Guaranidrilus glandulosus Cernosvitov, 1937a:149–151, figs. 1–9.—1937b:282.—Christoffersen, 1977:table 1.—Healy, 1979:8, table 1.

Material examined.—Syntypes, BMNH 1949.3.1.949–950, transverse and tangential sections; BMNH 1949.3.1.951–952, sagittal sections; BMNH 1949.3.1.953, whole-mounted specimens; collected at Loreto, Misiones, Argentina, 18.XI.1931.

Habitat and distribution.—In rich humic soil and in the detritus along a small stream. Loreto, near Santa Ana, Misiones, Argentina.

Remarks.—The specimens or parts of specimens catalogued as BMNH 1949.3.1.952 and 953 were not suitable for observations of internal structures.

In the complete description *Guaranidrilus glandulosus*, Cernosvitov (1937a, p. 151) stated that compact esophageal appendages “peptonéphridies” are located dorso-laterally in VI. Such structures were not found in any of BMNH 1949.3.1.949–951. Even though the ducts of the spermathecae follow a circuitous route into segment VI (Fig. 3, e) sections of these would not be confused with esophageal appendages as the cellular structures of these organs are distinctive (see Figs. 3, 4).

Cernosvitov (1937b) recognized two other species of *Guaranidrilus* in the material obtained from Argentina, but only *Guaranidrilus rarus* was described by him (Cernosvitov 1937a) at the same time as *G. glandulosus*; *G. cernosvitovi* was not described until some years later by Healy (1979). Both *G. rarus* and *G. cernosvitovi* are reported to have esophageal appendages, as did all the type specimens of them

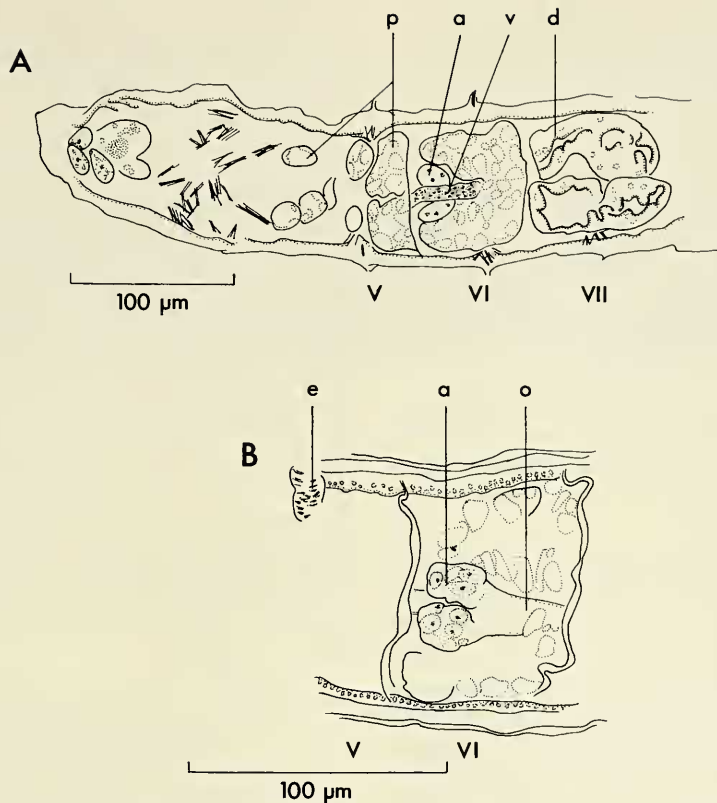


Fig. 4. A–B, *Guaranidrilus rarus*, BMNH 1949.3.1.955. A, Dorsal sagittal section of segments I through VII showing esophageal appendages; B, Enlargement of esophageal appendages, sagittal section ventral to dorsal blood vessel. Abbreviations: a, esophageal appendages; d, gut diverticulum; e, spermathecal ectal ducts; o, esophagus; p, pharyngeal glands; v, dorsal blood vessel.

examined here (see below). Cernovitov (1937a, fig. 9, pt) clearly showed esophageal appendages in his illustration of *G. glandulosus* and it seems possible that he confused two species, but the type material that is still usable is of one species, without such appendages.

Guaranidrilus oiepe Righi, 1974

Fig. 2

Guaranidrilus oiepe Righi, 1974:140–141, figs. 32–40.—1975:144.—1981:427–428.—Christoffersen, 1977:table 1.

Habitat and distribution.—In decomposing wood covered with grasses, in a tem-

porary pond. Mato Grosso, Rio de Janeiro, and Minas Gerais, Brazil.

Remarks.—Specimens of *Guaranidrilus oiepe* with sperm in the spermathecae have never been found, possibly indicating that the specimens seen were not mature or that the species is parthenogenetic. This species was distinguished from *G. glandulosus* by the shape and distribution of pharyngeal glands and by the shape of the intestinal diverticula (Righi 1974) (Fig. 2). Good records of intraspecific variation for either of these characters are not available. Re-examination of *G. oiepe* is required to further substantiate its specific distinction from *G. glandulosus*. Type and other material is not

currently available for loan outside the country of its origin (Righi, pers. comm.).

Guaranidrilus europeus Healy, 1979

Fig. 2

Guaranidrilus europeus Healy, 1979:11–13, figs. 2a–i, 3a–d.

Material examined.—Paratype, BMNH 1978.39.2, whole-mounted; collected at le Corneau near Arcachon, France, 21.X.1977, by B. Healy.

Habitat and distribution.—Wet, marshy pasture at the edge of a small pond, pasture soil, and in moist sandy loam. Near Arcachon, southwest France and Roncesvalles, Spanish Pyrenees.

Remarks.—For the purpose of comparison with the South American species, some characteristics are noted from the type material in addition to the description made by Healy (1979). The setae of anterior segments were notably shorter than the setae of posteriormost segments (Fig. 2); nephridia were present from 6/7; and secondary pharyngeal glands were present in V and VI (Fig. 2). No scattered glands on the wall of the spermathecal ectal duct, as reported by Healy, were obvious in the fixed material but cells of the walls of the duct were coarsely granular. Gland cells of the clitellum were irregularly interspersed with hyaline cells in dorso-lateral regions. Penial bulbs were no more than glandular areas in the epidermis surrounding the male pores.

Guaranidrilus europeus was described as lacking a seminal vesicle but evidence of a very small seminal vesicle (Fig. 2) was found in the one specimen examined here. The form of the pharyngeal glands, spermatheca, and possibly the gut diverticula still distinguish it from the other species without esophageal appendages (Fig. 2).

Guaranidrilus finni Christoffersen, 1977

Fig. 2

Guaranidrilus finni Christoffersen, 1977: 188–190, figs. 1–12, table 1.

Habitat and distribution.—Banks of a small brook. Evangelista de Souza, Serra do Mar range, Sao Paulo, Brazil.

Remarks.—This species is distinctively larger than the other species without esophageal appendages (Fig. 2). The sperm funnels and spermathecae are correspondingly proportioned. *Guaranidrilus finni* is also unique in having encapsulated sperm bundles in the spermathecae (Fig. 2).

Phylogenetic analyses (Coates 198b, in press) indicate that *Guaranidrilus finni* is closely related to the larger species of *Guaranidrilus* with esophageal appendages rather than to other nominal species of *Guaranidrilus* lacking such appendages. In *G. finni* the absence of esophageal appendages is a derived character state. The opinion of Christoffersen (1977) that *G. finni* and *G. atlanticus*, in particular, had a close affinity also is supported.

B. Some species with esophageal appendages in VI

Guaranidrilus rarus Cernosvitov, 1937

Fig. 4

Guaranidrilus rarus Cernosvitov, 1937a: 151–153, figs. 10–15.—1937b:282.—Christoffersen, 1977:table 1.—Healy, 1979:14–15, table 1.

?*Guaranidrilus sawayai* Righi, 1973:470–472, figs. 1–9.—1975 [as *G. rarus*]:143–144.—1981:428, figs. 1–2.—Christoffersen, 1977:table 1.

Material examined.—Syntypes, BMNH 1949.3.1.955, tangentially sectioned, BMNH 1949.3.1.954, whole-mounted; collected at Loreto, Misiones, Argentina, 27.XII.1931, by L. Cernosvitov.

Habitat and distribution.—Under the bark of an old tree, in a tree-growing bromeliad; in a periodically flooded stream bed near Rio Parana; near Rio Capiroa. Loreto near Santa Ana, Mision, Argentina; Serra do Cipo, Minas Gerais, and Bataguassu, Mato Grosso, Brazil.

Remarks.—The whole-mounted type



Fig. 5. *Guaranidrilus cernovitovi*, BMNH 1949.3.1.960.1A, sagittal lateral section showing prostomium to segment VII, with expansion of ectal duct of one spermatheca and one esophageal appendage. Abbreviations: a, esophageal appendages; e, spermathecal ectal ducts.

BMNH 1949.3.1.954 was unidentifiable and, if an oligochaete, immature.

The original description of *Guaranidrilus rarus* (Cernovitov 1937a) indicated that the esophageal appendages in VI were ventral. Examination of the type material has shown this to be incorrect, and the esophageal appendages are dorso-lateral, as usual for the genus (Fig. 4A, B, a). Righi (1973, 1981) already may have recognized this error as he did not indicate any difference between *G. rarus* and *G. sawayai* for that character.

Righi (1973, 1975, 1981) has compared *Guaranidrilus rarus* to *G. sawayai* in detail. He most recently (1981) suggested that some of the characters he originally used to distinguish these, in particular the form of the brain and the form of the intestinal diverticula, were not good specific characters as presently determined. Righi (1973) described *G. sawayai* as possessing small, rounded penial bulbs. Bulbs were not apparent in his figures of the species, although a few small structures once were indicated around the male pore (Righi 1973, fig. 9). Penial gland development in sexually mature specimens may show enough variation

in the species so that the state recorded for *G. sawayai* is not different from their absence as recorded for *G. rarus*. As Healy (1979) pointed out, the description of *G. rarus* was based on very few specimens.

Other characters that Righi (1981) identified as having states distinguishing *Guaranidrilus rarus* from *G. sawayai* were secondary pharyngeal glands and the position of the most anterior pair of nephridia. As *G. sawayai*, the sectioned type material of *G. rarus* has secondary glands in V and VI and the first pair of nephridia on 6/7. Righi also indicated that the intestinal diverticula in *G. sawayai* extended across the dorsal surface of the gut. Such a dorsal continuity could not be seen clearly in any available material of *G. rarus* (Fig. 4A, d) but this too could fall within the range of intraspecific variation recognized for other species of *Guaranidrilus* (Christoffersen 1977).

Observations of available material strongly suggest that *Guaranidrilus sawayai* is a junior synonym of *G. rarus*. Examination of type material of *G. sawayai* ultimately is required to decide the status of the synonymy.

Data available in the literature regarding the lengths of setae (Righi 1973) for *Guaranidrilus sawayai*, 3 μm anteriorly and 15 μm posteriorly, are very likely incorrect because the cuticle of the body wall is often thicker in an enchytraeid than the former measurement.

Guaranidrilus cernosvitovi Healy, 1979
Fig. 5

Guaranidrilus fridericoides Cernosvitov, 1937b:282, nomen nudum.

Guaranidrilus cernosvitovi Healy, 1979:10–11, fig. 1a–f, table 1.

Material examined.—Paratypes, BMNH 1949.3.1.960a–c, 2 sagittally sectioned specimens on three slides, BMNH 1949.3.1.957/8, whole-mounted specimen; collected at Loreto, Misiones, Argentina, 12.VI.1932.

Remarks.—The accession numbers for the holotype and other paratypes are, respectively, BMNH 1949.3.1.956 and 1949.3.1.959, 961a–b and 962–967 (E. G. Easton, pers. comm.). Accession numbers for this species were not correctly indicated in Healy (1979).

Guaranidrilus cernosvitovi is one of the larger nominal species of *Guaranidrilus*, belonging in a lineage with *G. finni* and *G. atlanticus* and several other South American species (Coates, in press b). It shares with these the character of ventral epidermal copulatory pads or papillae, occurring primarily in the clitellar region. As other nominal species of *Guaranidrilus* and “lower enchytraeids,” *G. cernosvitovi* retains a sperm-containing expansion on each of the spermathecal ectal ducts just ental to the spermathecal pore (Fig. 5, e). These apparently were overlooked by Healy (1979). The esophageal appendages of this species are associated with large blood sinuses (Fig. 5, a).

Acknowledgments

We are indebted to Buddy Clairain and Charlie Newling of the U.S. Army Corps of

Engineers Waterways Station, Vicksburg, Mississippi, for collection of the material and permission to publish this report.

This paper is Contribution No. 1435 of the Virginia Institute of Marine Science.

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